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THE TIMES OF INDIA

Wed, 28 April 2021

Jaisalmer: Army assesses upgraded combat vehicles at war exercise

Jaisalmer: In order to check its artillery capacity and boost its fire power, the Indian army is assessing the capabilities of its fighter vehicles at the desert war game exercises held at Pokhran field firing range in Jaisalmer.

In this series, after Arjun Tank mark 1, on Sunday, the recently upgraded Sarath BMP 2's ICV (infant combat vehicles)'s firing capacity was checked. BMP 2 demonstrated its excellent firing capability at the war exercise and proved its relevance by hitting the pseudo targets at night. Earlier, BMP fighter vehicle did not have the capacity of firing in the night. Recently, ordinance factory board made a lot of changes in its features and developed capacity for firing during night.

Image used for representational purpose only

Konark Core commander Lt Gen BS Manhas and Battle Axe division General Officer Commanding Major General Ajeet Singh Gehlot and other officers were present during the fire power desert demonstration.

According to reliable defence sources, the Indian Army looking at the new challenges it faces daily, is continuously trying to increase its firing capacity and that DRDO and ordinance factory board, looking at the requirements of the army, are trying to prepare improved versions of its existing fighter vehicles.

According to sources, the present fighter vehicles equipped with weapons of the army were not capable to work during night, so private and government agencies, experts and scientists are working to improve them as the capacities have to be expanded to deal with the present challenges and to protect our borders.

A source said, "Equipped with a rapid fire 7.62 MM medium coaxial machine gun, a 30 MM cannon and a second generation homing type anti-tank guided missile, the Sarath BMP-II can neutralise all kinds of land-based and low-flying military objects."

Sources said that the army has started preparing to up its capacity to fight during night. For this, necessary changes are being made in the army's infantry combat vehicles, to make them capable for night fight. According to information, the army has included improved features in recently developed BMP 2 infantry combat vehicles, especially developing capacity to fire in the night. It is provided with sharp night-vision devices and a low silhouette.

Sources said that its weight is 14.6 tonne and the BMP 2's maximum speed on road is 70kmph.

Sources said that Sarath BMP 2 was tested in night on Sunday, wherein many army officers were present. It hit the target and proved its relevance.

https://timesofindia.indiatimes.com/city/jaipur/jaisalmer-army-assesses-upgraded-combat-vehicles-at-war-exercise/articleshow/82268647.cms

THE TIMES OF INDIA

Wed, 28 April 2021

New school & inter-city buses to have fire alarm & suppression system, govt proposes changes in vehicle standards

By Dipak K Dash

New Delhi: In the next one and a half year all new school buses and inter-city buses will need to have fire detection and alarm systems and also the system to suppress the fire so that passengers get enough time to get out of the bus, in case of a fire.

The road transport ministry has issued a draft notification to amend the Automotive Industry Standards (AIS) based on experiments carried out by the Defence Research and Development Organisation (DRDO) for introduction of protection of occupants from fire.

Currently, fire detection, alarm and suppression systems are notified for fires originating from the engine compartment. "Provisions regarding protection of occupants from fire under this amendment are aimed at proving an additional evacuation time to the occupants and thus will further enhance the safety in fire incidents in buses," the draft notification said.

It has specified that the system has to be such that any fire can be detected irrespective of whether the engine is on or off. An official said, if the heat can be controlled in a bus 3-4 minutes, the passenger can safely get out of a bus. In intra-city or local buses, it's easy to deboard since these have open windows and passengers are awake.

Officials said this system can also be installed in existing buses.

Majority of fatal and non-fatal injuries to passengers in bus fire accidents in India are due to heat and smoke in the passenger compartment irrespective of origin of fire in the vehicle. "The fatal and non-fatal injuries to passengers in bus fire accidents on Indian roads can be prevented, if the heat and smoke in the occupant compartment is controlled irrespective of origin of fire in the vehicle and thus providing an evacuation window to the occupants," the government document said.

According to the proposal, the buses will have water tanks and this water can be sprayed like mist at high pressure through nozzles which will be fixed inside the bus at different locations. Sources said the buses will have thermal censors and the system to control heat can be activated either manually or automatically.

https://timesofindia.indiatimes.com/india/new-school-inter-city-buses-to-have-fire-alarm-suppression-system-govt-proposes-changes-in-vehicle-standards/articleshow/82272014.cms

Outlook

Wed, 28 April 2021

Transport ministry pitches for fire detection, alarm system on all new school, intercity buses

New Delhi: The road transport ministry has proposed the installation of fire detection and alarm system in all new school and intercity buses to enhance safety in case of fire incidents.

The ministry has issued a draft notification to amend Automotive Industry Standards (AIS) based on experiments carried out by the Defence Research and Development Organisation (DRDO) for the introduction of protection of occupants from fire.

"Presently fire detection, alarm and suppression systems are notified for fires originating from the engine compartment.

"Provisions regarding the protection of occupants from the fire under this amendment are aimed at providing an additional evacuation time to the occupants and thus will further enhance the safety in fire incidents in buses," the draft document said.

The fire alarm system shall be installed according to the system manufacturer"s installation manual and the fire shall be detected and the warning signal shall be activated within 30 seconds after ignition of test fire, it said.

The buses will have water tanks and discharge of water as extinguishing agent shall be along the length of the bus, in three headers, in such a way that mist is targeted to the seats on the left side, right side with the nozzle spacing up to 1,500 mm as well as on the midsection of the ceiling for cooling of smoke layer, the document added.

The draft document pointed out that a majority of fatal and non-fatal injuries to passengers in bus fire accidents on Indian roads are due to heat and smoke in the passenger compartment irrespective of the origin of the fire in the vehicle.

"The fatal and non-fatal injuries to passengers in bus fire accidents on Indian roads can be prevented if, irrespective of the origin of the fire in the vehicle, the heat and smoke in occupant compartment is controlled and thus providing an evacuation window to the occupants," it noted.

The draft document is posted on the Ministry of Road Transport and Highways and all stakeholders can send their comments within 30 days.

Last year on November 9, Union Road Transport Minister Nitin Gadkari and Defence Minister Rajnath Singh had witnessed the demonstration of Fire Detection and Suppression System (FDSS) -- a technology developed by DRDO, which can detect fire in buses in less than 30 seconds and extinguish it in 60 seconds.

Demonstrations were given on water mist-based FDSS for the passenger compartment and aerosol-based FDSS for an engine fire.

(Disclaimer: This story has not been edited by Outlook staff and is auto-generated from news agency feeds. Source: PTI)

https://www.outlookindia.com/newsscroll/transport-ministry-pitches-for-fire-detection-alarm-system-on-all-new-school-intercity-buses/2072276

COVID 19: DRDO's Contribution

Wed, 28 April 2021

What is DRDO's supplemental Oxygen Delivery System and how it can prove to be a boon in the COVID-19 pandemic?

DRDO's Defence Bio-Engineering Electro Medical Laboratory (DEBEL), Bengaluru has developed a SpO2 (Blood Oxygen Saturation) supplemental Oxygen Delivery System for moderate COVID-19 patients and soldiers posted at extreme high-altitude areas

By Arfa Javaid

In a landmark achievement, DRDO's Defence Bio-Engineering & Electro Medical Laboratory (DEBEL), Bengaluru has developed a SpO2 (Blood Oxygen Saturation) supplemental Oxygen Delivery System. The automatic system can prove to be a boon during the ongoing COVID-19 pandemic and to soldiers posted at extreme high-altitude areas.

The system developed by DEBEL will help in delivering supplemental oxygen based on the SpO2 levels, preventing the person from sinking into a state of Hypoxia (fatal in most cases, if sets in).

DRDO's supplemental Oxygen Delivery System

Hypoxia

It is a state where the amount of oxygen reaching the tissues is not adequate to meet all the energy requirements of the body. The exact situation is replicated in COVID-19 positive patients and has been a leading factor in the ongoing crisis.

As per the press release by the Ministry of Defence, the electronic hardware of the system is designed to function at extreme altitudes with low barometric pressures, low temperatures and humidity. The software safety checks which are incorporated in the system plays a crucial role in ensuring the functional reliability of the system in field conditions.

How does the system work?

The automated system developed by DRDO reads the SpO2 levels of an individual with the help of a wrist-worn pulse oximeter module through a wireless interface and controls a proportional solenoid valve to regulate the oxygen supply to the patient. The patient will receive oxygen from a lightweight portable oxygen cylinder through nasal nares.

As per the Ministry, the system is available in various sizes ranging from one litre and one kg weight with 150 litres of oxygen supply to 10 litres and 10 kg weight with 1,500 litres of oxygen supply which is expected to sustain for around 750 minutes with a continuous flow of two litres per min (lpm). The automated system with the dual qualities of being robust and cheap is already in bulk production with the industry.

Boon to the ongoing COVID-19 pandemic

The system is a boon to the ongoing crisis arising due to the COVID-19 pandemic. It can be used in the houses for moderate COVID-19 infected patients for Oxygen flow therapy with flow controlled at 2/5/7/10 lpm flow. The wrist-worn oximeter will give an alarm in cases of lower

SpO2 value. It will also increase or decrease the oxygen flow based on SpO2 settings which can be automatically adjusted at 2,5,7,10 lpm flow rate.

Due to its availability and uncomplicated usage by a common man, the system will reduce the workload and exposure time of doctors and paramedics at large.

What is SpO2?

Saturation of Peripheral Oxygen (SpO2) is the measure of the amount of oxygen-carrying haemoglobin in the blood to the amount of haemoglobin not carrying oxygen. It is also referred to as Oxygen Saturation.

Condition	**SpO2 range**
Normal	95-100%
Brain gets affected	80-85%
Cyanosis	65%

"The automated Calibrated Variable Flow Control for Low O2 levels (User pre-set, <90%, <80%) through a calibrated Flow Control Valve (PFCV) will facilitate in economising the oxygen supply (1-10 lpm with ±0.5 lpm). A moderate Covid patient requires longtime moderate O2 supply 10Litre/150bar–10kg–1500 litres which can sustain up to 750 minutes," the Ministry said in a press note.

The automated and uncomplicated Oxygen Delivery System will prove to be a boon in the current crisis when medical resources are stretched to their limits. Its proliferation would mitigate the crisis in the management of a huge number of COVID-19 positive patients in many ways pan India.

https://www.jagranjosh.com/general-knowledge/drdos-spo2-supplemental-oxygen-delivery-system-1619517150-1

जागरण

Wed, 28 April 2021

तैयार होने लगा लखनऊ के DRDO-COVID अस्पताल का आईसीयू, काम हुआ तेज

अवध शिल्प ग्राम में अब डीआरडीओ 500 बेड का कोविड अस्पताल बना रहा है। जिंसमे 150 बेड की आईसीयू भी होगी। डीआरडीओ ने 20 हजार लीटर की मेडिकल ऑक्सीजन की क्षमता का एक टैंक लगा दिया है। जबकि दूसरा टैंक भी राजस्थान से मंगाया गया है।

By Rafiya Naz

लखनऊ: अवध शिल्प ग्राम में बन रहे डीआरडीओ के कोविड अस्पताल में अब आईसीयू और ऑक्सीजन वाले वार्ड में उपकरणों की फिटिंग का काम तेज हो गया है। सोमवार को हर बेड पर आईसीयू मॉनिटर और अन्य एडवांस लाइफ सपोर्ट सिस्टम को असेम्बल करने का काम पूरा हो गया। अब मंगलवार या बुधवार तक आईसीयू बेड की खेप आते ही उसको भी तैयार कर लिया जाएगा। वहीं सोमवार को यूपी के चिकित्सा और स्वास्थ्य महानिदेशक और डीआरडीओ के कई अधिकारियों की टीम भी मौके पर पहुंची। टीम ने डीआरडीओ अस्पताल की तैयारियों का जायजा लिया।

अवध शिल्प ग्राम में अब डीआरडीओ 500 बेड का कोविड अस्पताल बना रहा है। जिंसमे 150 बेड की आईसीयू भी होगी। डीआरडीओ ने 20 हजार लीटर की मेडिकल ऑक्सीजन की क्षमता का एक टैंक लगा दिया है। जबकि दूसरा टैंक भी राजस्थान से मंगाया गया है। यहां 40 हजार लीटर लिक्विड मेडिकल ऑक्सीजन को वेपोराइजर प्लांट में कम्प्रेस्ड कर उसको पाइप लाइन से हर एक बिस्तर तक भेजा जाएगा। कोविड मरीजों की भर्ती के लिए तीन ब्लॉक और जर्मन हैंगर से एसी युक्त पंडाल बनाया जा रहा है। दो ब्लॉक में 150 बेड का आईसीयू होगा।।जबकि एक ब्लॉक ऑक्सीजन वाले मरीजों के लिए होगा। सोमवार को इसी ऑक्सीजन वाले ब्लॉक करने की तैयारी चल रही थी।

हर एक बेड पर मरीजों की दवा और रिकॉर्ड रखने वाली ट्राली लगा दी गई। जबकि मरीजों के लिए बेड के हिस्सों और गद्दे लाये गए। बेड के हिस्सों को असेम्बल कर उसपर गद्दा डाला जाएगा। वहीं आईसीयू में मॉनिटर और लाइफ सपोर्ट सिस्टम की फिटिंग की गई। जल्द ही यहां 200 आईसीयू बेड की बड़ी खेप आ जाएगी। जिनको आईसीयू में लगाया जाएगा। वही जर्मन हैंगर में भी एसी लगा दिए गए। अब यहां फ्लोर बनाने का काम अंतिम चरण में है। डीआरडीओ अस्पताल के नियंत्रण के लिए यहां कमांड सेंटर का काम भी लगभग पूरा हो गया है।

https://www.jagran.com/uttar-pradesh/lucknow-city-drdo-covid-hospital-icu-is-being-prepared-work-in-progress-in-lucknow-21595423.html

जागरण

Wed, 28 April 2021

टाटा संस DRDO के साथ मिलकर सरकारी अस्पतालों के लिए करेगी काम, खत्म होगी ऑक्सीजन की किल्लत

देश की डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गेनाइजेशन (डीआरडीओ) और टाटा संस मिलकर देश के बड़े सरकारी अस्पतालों में ऑक्सीजन की किल्लत को दूर करने के लिए पहल करेगी। दोनों संगठन सरकारी अस्पतालों में ऑक्सीजन जनरेशन प्लांट लगाएगी।

By Rajesh Ranjan

जमशेदपुर: देश की डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गेनाइजेशन (डीआरडीओ) और टाटा संस मिलकर देश के बड़े सरकारी अस्पतालों में ऑक्सीजन की किल्लत को दूर करने के लिए पहल करेगी। केंद्र सरकार से प्राप्त आदेश के बाद दोनों संगठन एम्स, एनआईसी झज्जर, राम मनोहर लोहिया अस्पताल सहित दूसरे सरकारी अस्पतालों में ऑक्सीजन जनरेशन प्लांट लगाएगी। जिससे प्रति मिनट 1000 लीटर ऑक्सीजन का उत्पादन होगा।

पिछले दिनों नई दिल्ली में केंद्रीय स्वास्थ्य मंत्री हर्षवर्द्धन की अध्यक्षता में हुई हाई लेवल मीटिंग में यह निर्णय लिया गया। इस बैठक में विभिन्न केंद्रीय सरकारी अस्पतालों में अखिल भारतीय आयुर्विज्ञान संस्थान (एम्स) में ऑक्सीजन की उपलब्धता की स्थिति की समीक्षा की गई। इसके बाद ऑक्सीजन की कमी को दूर करने के लिए स्थायी समाधान निकाला गया। आपको बता दें कि टाटा संस अब तक देश में अपने स्तर से हर दिन 600 टन लिक्विड मेडिकल ऑक्सीजन की आपूर्ति कर रही है। इसके लिए सिंगापुर से 24 क्रायोजेनिक सिलेंडर भी टाटा समूह आयात कर रही है। लेकिन अब टाटा समूह ऑक्सीजन की किल्लत का स्थायी समाधान के लिए पहल कर रही है। इसके लिए टाटा समूह के विशेषज्ञों की टीम इस प्रोजेक्ट के लिए अपना योगदान देंगे ताकि ऑक्सीजन की कमी से किसी भी मरीज की मौत न हो। इसके अलावे केंद्रीय स्वास्थ्य मंत्री ने सभी राज्यों में कोविड 19 के मरीजों की संख्या बढ़ने, आइसीयू बेड सहित जरूरी दवाओं की स्थिति की भी समीक्षा की। उम्मीद की जा रही है कि देश के सभी बड़े अस्पतालों में ऑक्सीजन जनरेशन प्लांट तैयार किए जाएंगे।

टाटा को आक्सीजन उत्पादन का लंबा अनुभव

टाटा को आक्सीजन उत्पादन का पुराना अनुभव है। टाटा स्टील का जमशेदपुर में बडा प्लांट है। यहां आक्सीजन उत्पादन संयत्र संचालित है।

https://www.jagran.com/jharkhand/jamshedpur-tata-sons-to-work-with-drdo-for-government-hospitals-oxygen-shortage-will-end-21595088.html

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Tue, 27 April 2021 5:11PM

Chief of Army Staff visits Siachen and Eastern Ladakh

Gen MM Naravane, Chief of Army Staff visited Siachen and Eastern Ladakh today and reviewed the operational situation in the sectors. He was accompanied by Lt Gen YK Joshi, Army Commander, Northern Command and Lt Gen PGK Menon, GOC, Fire & Fury Corps.

Gen Naravane interacted with the troops and complimented them for their steadfastness and high morale, while being deployed in some of the harshest terrain, altitude and weather conditions.

The COAS was later briefed by GOC Fire and Fury Corps on the prevailing security situation and operational preparedness in the Corps Zone. The Army Chief is scheduled to return back on 28 April 2021.

https://pib.gov.in/PressReleasePage.aspx?PRID=1714369

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 27 April 2021 5:11PM

थल सेनाध्यक्ष ने सियाचिन और पूर्वी लद्दाख का दौरा किया

थल सेनाध्यक्ष जनरल एम.एम. नरवणे ने आज सियाचिन और पूर्वी लद्दाख का दौरा किया और इन इलाकों में सुरक्षा स्थितियों का जायज़ा लिया। उनके साथ उत्तरी कमान के सेना कमांडर लेफ्टिनेंट जनरल वाई. के. जोशी और फायर एंड फ्यूरी कॉर्प्स के कमांडिंग जनरल अधिकारी लेफ्टिनेंट जनरल पी.जी.के. मेनन भी मौजूद थे।

जनरल नरवणे ने इन क्षेत्रों में तैनात सेना के जवानों से मुलाक़ात की और कठिन परिस्थितियों तथा कठोर मौसम के दौरान ऊंचाई वाले इलाकों में सीमाओं की रक्षा में मुस्तैद रहने पर उनका हौसला बढ़ाया और उनकी दृढ़ता एवं उच्च मनोबल के लिए सराहना की।

फायर एंड फ्यूरी कॉर्प्स के कमांडिंग जनरल अधिकारी ने सेना प्रमुख को इन इलाकों की मौजूदा सुरक्षा स्थिति और सेना की तैयारियों के बारे में जानकारी दी। सेना प्रमुख 28 अप्रैल, 2021 को वापस लौटेंगे।

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1714413

Hindustan Times

Wed, 28 April 2021

Rajnath Singh asks Governors to rope in ex-servicemen for Covid relief; Navy on standby to bring oxygen containers

The defence ministry has asked the governors and LGs to rope in ex-servicemen to help in the fight against Covid-19. Meanwhile, the Indian Navy has now been put on standby to aid the government in bringing in oxygen tankers from overseas

By Abhishek Bhalla

New Delhi: Defence Minister Rajnath Singh on Tuesday urged the governors and Lieutenant Governors (LGs) to rope in ex-servicemen as part of augmentation of human resource to assist state and district administration in battling Covid-19.

"The defence minister has asked the governors and LGs to get former medical personnel as well as others from the armed forces to help civil authorities," said an official privy to the telephonic conversation.

All medical personnel from the armed forces who have retired or taken pre-mature retirement in the last two years are being recalled to work in Covid-19 facilities within proximity of their present place of residence, Chief of Defence Staff (CDS) General Bipin Rawat informed Prime Minister Narendra Modi on Monday.

After the Indian Air Force, the Navy has now been put on standby to aid the government in bringing in oxygen tankers from overseas.(Representative Image)

The Chief of Defence Staff General Bipin Rawat briefed the Prime Minister on efforts and preparations done by the armed forces to combat the fresh surge of Covid 19 across the country. He informed the PM that armed forces were creating medical facilities in large numbers and where possible military medical infrastructure will be made available to civilians.

“Other medical officers who retired earlier have also been requested to make their services available for consultation through medical emergency help lines,” an official statement said.

The CDS also informed the prime minister that all medical officers on staff appointments at Command HQ, Corps HQ, Division HQ & similar HQ of Navy and Air Force will be employed at hospitals.

After IAF, Indian Navy on Standby to Bring in Oxygen Containers from Overseas

After the Indian Air Force (IAF), Navy vessels have been put on standby and may be deployed to assist in the transportation of liquid oxygen tankers and other Covid-19 relief material from overseas.

Heavy lift ships in the Gulf and those close to South East Asian countries have been directed to check readiness for such operations, said sources in the Indian Navy.

With hospitals in parts of the country running short of medical oxygen due to lack of containers, the IAF has airlifted 14 containers from overseas till now— four each from Singapore and Bangkok and six from Dubai.

The Indian Navy has been asked to remain on standby to augment the oxygen supply and ensure there is no shortage as Covid-19 cases continue to surge. The need for a steady supply of oxygen is a must for the long haul, sources added.

The Navy has been ensuring a steady supply of Covid relief material to the islands of Lakshadweep that hold strategic importance for India.

The ships have more capacity to carry oxygen containers and will supplement the efforts of the IAF.

On April 26, a C17 aircraft of the IAF airlifted six empty cryogenic oxygen containers from Dubai and landed at Panagarh in West Bengal the same evening. Another C17 aircraft of IAF airlifted four empty containers from Bangkok and landed at Panagarh early morning on April 27.

Another C17 flew to Dubai on April 27 to airlift more containers. Earlier, the IAF had airlifted four containers from Singapore.

The IAF also airlifted cryogenic oxygen container from Baroda to Ranchi, two containers from Pune to Jamnagar, two from Bhopal to Jamnagar, three from Jaipur to Jamnagar, three from Indore and Bhopal to Jamnagar and one from Hindan to Panagarh.

Defence Minister Rajnath Singh also spoke to governors and LGs urging them to ask state governments to get help from ex-servicemen to assist in Covid-19 relief measures.

https://www.indiatoday.in/coronavirus-outbreak/story/iaf-indian-navy-oxygen-containers-overseas-1795570-2021-04-27

THE HINDU

Wed, 28 April 2021

Coronavirus | Walk the extra mile in creating mitigation facilities, says Gen. Rawat

The three services as well as other wings of the defence ministry have been extending support to various State governments and Union Territories

New Delhi: Chief of Defence Staff (CDS) Gen. Bipin Rawat on Tuesday called on the armed forces to rise to the occasion and support the civil administration in creating COVID-19 mitigation facilities in a time-bound manner.

"Timely support at this juncture is important," Gen. Rawat said in a message to the forces.

"Our men and women in uniform have the will and dedication to break barriers and walk the extra mile, always and every time," he said. "We can and we will. Well done and carry on. We still have long distances to travel."

The Services have pressed in personnel and resources to assist the civil administration in dealing with the pandemic.

Chief of Defence Staff General Bipin Rawat. File | Photo Credit: PTI

Reviewing the situation with Prime Minister Narendra Modi on Monday, Gen. Rawat said oxygen cylinders available with the armed forces at various establishments will be released for hospitals.

The IAF has deployed heavy transport aircraft to transport cryogenic oxygen containers from several countries which have been procured as part of commercial agreements and transfer oxygen containers within the country.

On Tuesday, Defence Minister Rajnath Singh approved temporary hiring of additional contractual staff in 51 high pressure Ex-servicemen Contributory Health Scheme(ECHS) polyclinics to cater to veterans and their dependants, the Defence Ministry said.

"The contractual staff, including one each of medical officer, nursing assistant, pharmacist, driver and chowkidar for identified ECHS polyclinics, will be hired through station headquarters for night duty, beyond normal working hours, for three months, the statement said. The validity of this sanction is up to August 15, 2021."

Navy launches oxygen express

The Navy too had launched an oxygen express via the sea to transport cylinders and other supplies to Lakshadweep. The second consignment as part of this was sent on Tuesday.

The Navy's IN LCU 55 arrived in Port Blair on Monday with oxygen cylinders and Multi feed Oxygen Manifolds, manufactured by the Naval Dockyard, Vizag.

https://www.thehindu.com/news/national/coronavirus-time-for-armed-forces-to-rise-to-occasion-says-bipin-rawat/article34422431.ece

Hindustan Times

Wed, 28 April 2021

Navy to get aircraft carrier Vikrant, missile destroyer Visakhapatnam in 2021

While the Chinese Navy has commissioned three main battleships last Saturday at Sanya in Hainan naval facility in disputed South China Sea, the Cochin shipyard will start final trials of INS Vikrant as precursor of handing over the carrier to the Indian Navy

By Shishir Gupta

New Delhi: Indian Navy is expected to get delivery of 45,000-tonne indigenous INS Vikrant aircraft carrier and 7,500-tonne Visakhapatnam class stealth guided missile destroyer by end-2021 to add to its capability to defend and dominate the Indo-Pacific region.

The indigenous aircraft carrier and INS Visakhapatnam will be formally commissioned into the Navy next year. "Contractual clauses come alive once the warship is handed over to Indian Navy but commissioning takes times as the vessel is to be tested by the Naval personnel for its capability," said a former Western Navy commander.

India's sole aircraft carrier INS Vikramaditya in joint patrol with USS Nimitz during 2017 Malabar exercises(File photo)

While the Chinese Navy has commissioned three main battleships last Saturday at Sanya in Hainan naval facility in disputed South China Sea, the Cochin shipyard will start final trials of INS Vikrant as precursor of handing over the carrier to the Indian Navy. The Mazagon Dockyards will complete trials of INS Visakhapatnam and deliver the stealth destroyer close to the Indian Navy Day.

Powered by General Electric turbines, INS Vikrant will carry two squadrons of MiG-29K fighters and 10 Kamov Ka -31 helicopters. The aircraft carrier strike force will have a range of over 15000 kilometre with Barak surface to air missile to give aerial protection to the vessel. INS Visakhapatnam's main attack weapon is anti-ship and land attack BrahMos cruise missiles apart from torpedos for anti-submarine warfare.

With the Indian Navy deciding to give preference to nuclear powered conventional submarines in future sea-warfare, the third aircraft carrier also called INS Vishal will now be seen as a replacement for the presently serving INS Vikramaditya.

India's sole aircraft carrier is currently under maintenance and will be available for operations in the coming months. The decision to project INS Vishal as a replacement for INS Vikramaditya means that the third aircraft carrier plan has not been shelved. Instead, it will go on concurrently so that there is no gap when INS Vikramaditya is decommissioned and mothballed.

In fact, Indian Navy will add more teeth to its capability next year when INS Arighat, India's second ballistic missile nuclear submarine, will be delivered to the Strategic Forces Command. The vessel is under trials and will be equipped with 3500 km K-4 intermediate range ballistic missiles.

https://www.hindustantimes.com/india-news/navy-to-get-aircraft-carrier-vikrant-missile-destroyer-visakhapatnam-in-2021-101619498533809.html

Hindustan Times

Wed, 28 April 2021

IAF set to lease A330 mid-air refueller from France for training

The A330 refuellers of France and UAE air force have been used to ferry as many as 17 Rafale omni-role fighters to India from Merignac-Bordeaux air base since July 2020. Another seven fighters are due to arrive in India in May

By Shishir Gupta

The Indian Air Force (IAF) has approached the French government to lease one Airbus A330 multi-role tanker transport aircraft for training purposes as a precursor to lease five more mid-air refuellers for increasing the combat capability and radius of its multi-role fighters.

The leasing will be done on government-to-government basis with the IAF already issuing a request for information (RFI) for a single aircraft while a request for proposals route will be used for the additional five refuellers on lease. The issue was discussed during Air Chief Marshal RKS Bhadauria's visit to France last week.

"With IAF looking towards A330 refuellers for its future, it is only natural that its pilots are trained in advance to handle the aircraft as mid-air refuelling is a precision process with zero margin of error and huge stakes," said an IAF official.

The A330 refuellers of France and UAE air force have been used to ferry as many as 17 Rafale omni-role fighters to India from Merignac-Bordeaux air base since July 2020. Another seven fighters are due to arrive in India in May with a batch being deployed at the new Hashimara air base in West Bengal with Ambala being the first base.

The A330 can not only operate with load in thin atmosphere of Ladakh and beyond but also supply fuel to Indian fighters at Himalayan heights with combat radius of 1800 km and 50 tonnes of fuel for four hours.(Representational photo)

While IAF has six Russian origin IL-78 M mid-air refuellers, the A330 refuellers out-power the existing aircraft in terms of its versatility as the latter can not only carry fuel load but also carry troops and weapon pay-load on roll-on-roll-off basis. In case of IL-78 M, there have been limitations on load carrying as well as taking off with payload from high mountain bases like in Leh and Thoise.

The A330 can not only operate with load in thin atmosphere of Ladakh and beyond but also supply fuel to Indian fighters at Himalayan heights with combat radius of 1800 km and 50 tonnes of fuel for four hours. The A330 has a ferry range of 14,800 kilometres.

With top-of-the-line Rafale aircraft in its inventory, the IAF needs compatible mdi-air refuellers so that it is ready to counter any move from the north. The IAF has to be in a state of readiness as the Chinese army is reluctant in restoring status quo ante in Gogra-Hot Springs area of Eastern Ladakh while the PLA beefs up all along the Line of Actual Control till Arunachal Pradesh.

https://www.hindustantimes.com/india-news/iaf-set-to-lease-a-a330-mid-air-refueller-from-france-for-training-101619580441806.html

The Indian EXPRESS

Wed, 28 April 2021

Explained: Who are the world's top military spenders, what does the latest SIPRI report say?

In 2020, the United States' military spending was 3.7 per cent of its GDP while the corresponding numbers for China and India were 1.7 per cent and 2.9 per cent respectively

New Delhi: In its report on trends in global military expenditure in 2020, the Stockholm International Peace Research Institute (SIPRI) has found that the world's top military spenders — the US, China and India — saw their military spending go up compared to 2019, even during a pandemic year.

An Indian Army convoy in Ladakh during the India-China border dispute (File photo)

Last year, the US spent a total of $778 billion, China spent $252 billion and India's military expenditure was $72.9 billion. While India's spending since 2019 grew by 2.1 per cent, the increase for China was more moderate, at 1.9 per cent. The US saw a 4.4 per cent growth over its 2019 expenditure.

In total, the global military expenditure rose to $1981 billion last year, an increase of 2.6 per cent in real terms from 2019, the report said. It mentioned that the "2.6 per cent increase in world military spending came in a year" when the global GDP shrank by 4.4 per cent (October 2020 projection by the International Monetary Fund), "largely due to the economic impacts of the Covid-19 pandemic".

What SIPRI does

The Sweden-based SIPRI is an independent international institute dedicated to research into conflict, armaments, arms control and disarmament. It was established on the basis of a decision by the Swedish Parliament and receives a substantial part of its funding in the form of an annual grant from the Swedish Government.

Established in 1966, SIPRI provides data, analysis and recommendations, based on open sources, to policymakers, researchers, media and the interested public.

What the 2020 report says

In 2020, the United States' military spending was 3.7 per cent of its GDP while the corresponding numbers for China and India were 1.7 per cent and 2.9 per cent respectively.

From 2011 to 2020, American military expenditure dropped by 10 per cent, but China saw a 76 per cent growth while India's military spending grew by 34 per cent.

SIPRI said that military spending in Asia and Oceania "was 2.5 per cent higher in 2020 than in 2019 and 47 per cent higher than in 2011, continuing an uninterrupted upward trend since at least 1989" and attributed the rise "primarily to increases in spending by China and India, which together accounted for 62 per cent of total military expenditure in the region in 2020".

The other top spenders included Russia with $61.7 billion, the UK at $59.2 billion, Saudi Arabia at $57.5 billion, followed by Germany and France at just under $53 billion each.

Releasing the latest data, SIPRI said that the total "global military expenditure rose to $1981 billion last year, an increase of 2.6 per cent in real terms from 2019" and the "five biggest spenders in 2020, which together accounted for 62 per cent of global military expenditure".

As a consequence of the reduction in global GDP last year, it said that "military spending as a share of GDP—the military burden—reached a global average of 2.4 per cent in 2020, up from 2.2 per cent in 2019," which, it said, "was the biggest year-on-year rise in the military burden since the global financial and economic crisis in 2009".

While military spending did rise globally, some countries explicitly reallocated part of their planned military spending to pandemic response, such as Chile and South Korea, and many others, including Brazil and Russia, spent considerably less than their initial military budgets for 2020, the report said.

'We can say with some certainty that the pandemic did not have a significant impact on global military spending in 2020,' said Dr Diego Lopes da Silva, Researcher with the SIPRI Arms and Military Expenditure Programme. 'It remains to be seen whether countries will maintain this level of military spending through a second year of the pandemic.'

What SIPRI has said about India in the past

Earlier in March, a SIPRI report found that India's arms imports came down by a third between 2011-2015 and 2016-2020, at a time when the government has been trying to reduce the import dependence when it comes to defence platforms and weapons.

However, India remained the second highest importer, only behind Saudi Arabia. The top five global arms exporters were the US, Russia, France, Germany and China in 2016-2020.

In the study, SIPRI stated, "Arms imports by India decreased by 33 per cent between 2011–15 and 2016–20. Russia was the most affected supplier, although India's imports of US arms also fell, by 46 per cent."

The report attributed the fall not to the government's push to make India self-reliant in defence manufacturing, but to factors including reducing the dependence on Russian arms, and the complex procurement procedure.

"The drop in Indian arms imports seems to have been mainly due to its complex procurement processes, combined with an attempt to reduce its dependence on Russian arms.

Alexandra Kuimova, Researcher with the SIPRI Arms and Military Expenditure Programme, said, "Russia substantially increased its arms transfers to China, Algeria and Egypt between 2011–15 and 2016–20, but this did not offset the large drop in its arms exports to India."

The report stated that "international transfers of major arms stayed at the same level between 2011–15 and 2016–20" as the "substantial increases in transfers by three of the top five arms exporters — the USA, France and Germany — were largely offset by declining Russian and Chinese arms exports". The report said middle eastern arms imports grew by 25 per cent during this period, and was driven by Saudi Arabia, with a 61 per cent increase, and Egypt and Qatar, which saw a jump of 136 per cent and 361 per cent, respectively.

Before that, in its 2019 yearbook, SIPRI found that the worldwide total of nuclear warheads had decreased since 2018 but countries are modernising their nuclear arsenals, and said that nine nuclear-armed countries (including India) had a total of some 13,865 nuclear weapons at the start of 2019, which is a decrease of 600 nuclear weapons from 14,465 at the start of 2018.

The report separately counted "deployed warheads" (warheads placed on missiles or located on bases with operational forces) and "other warheads" (stored or reserve warheads and retired

warheads awaiting dismantlement). For India, it gave a figure of 130-140 "other warheads" in 2019, the same as in 2018.

https://indianexpress.com/article/explained/explained-worlds-top-military-spenders-latest-sipri-report-7291264/

Hindustan Times

Wed, 28 April 2021

PLA sets up joint defence units near Indian border

The setting up of the new, joint system is part of the Chinese WTC's (Western Theatre Command) focus on war preparation and exploring the establishment of a joint air defence system, the PLA's mouthpiece, PLA Daily reported on Tuesday

By Sutirtho Patranobis

Beijing: The Chinese People's Liberation Army (PLA) has, for the first time, inducted the army's air defence units in its air force command chain in a region which borders India to form a combined air defence system.

The setting up of the new, joint system is part of the Chinese WTC's (Western Theatre Command) focus on war preparation and exploring the establishment of a joint air defence system, the PLA's mouthpiece, PLA Daily reported on Tuesday.

The new system was tried out at a drill in the western theatre, the report said without sharing details about the location.(File photo/ Representative image)

The Western Theatre Command is responsible for the border with India, and continues large-scale deployment in the region – despite partial disengagement -- amid the year-long border friction in eastern Ladakh.

The mouthpiece called the new formation "a solid step… taken in the joint combat and joint training."

The new system was tried out at a drill in the western theatre, the report said without sharing details about the location.

The high-level exercise was a drill for checking the combat readiness of the army's air defence forces but the orders, during the drill, were given by the PLA's air force command stationed in the area -- a likely first for PLA.

According to a senior officer of the WTC's Air Force Staff Headquarters, more than 10 army air defence force units have entered the PLA Air Force (PLAAF) command chain in the WTC to share early warning information, to test combat readiness, to participate in major exercises and, overall, to form a "preliminary alliance".

"The integration of air defence across services and arms is a solid step to deepen joint operations," the PLA Daily article said.

The WTC's air force took the initiative to implement joint operations and organised troops from ground defence, radar and communications to "…work together with army commanders to tackle key problems, unify information interfaces, and formulate relevant standards and specifications."

The formation of the joint command is in line with a military training order issued by President Xi Jinping, also the head of the Central Military Commission (CMC), in January.

The order said that military training in 2021 will focus on actual combat training to raise combat readiness, joint command and joint specialised training, new equipment and force training, and operational system of systems integration training.

Xi had then said that PLA must be ready to "act at any second" as the armed forces had kicked off the year's military training and drills in January".

"[PLA must] increase the integration of new equipment, new forces and new combat realms into training and combat systems," Xi was quoted in reports as saying.

Following the formation of the new system, the changes in training modules have enabled the joint combat and joint training at all levels to be launched and improved simultaneously, Tuesday's PLA Daily article said.

In the final analysis, whether an army can win modern wars is determined by the level, level, and effectiveness of joint training, it added.

Last week, state media reported that PLA deployed advanced rocket launchers with an artillery brigade stationed above 17,000 feet in the WTC.

The front-page article published in the PLA Daily said the brigade is located more than 5,200 metres above sea level in the Xinjiang Uyghur Autonomous Region (XUAR) but did not share its exact location.

India and China have held several rounds of diplomatic and military talks to resolve the nearly year-long friction along the Line of Actual Control in eastern Ladakh.

The 10th meeting of the senior military commanders was held on February 20 after the two sides completed the withdrawal of frontline troops with armoured formations and artillery from the banks of Pangong Lake.

However, subsequently, the two sides were unable to make progress on efforts to disengage from other friction points such as Gogra, Hot Springs and Depsang Plains.

The 11th round of military talks held on April 9 failed to resolve the differences.

At the end of the 11th round, Beijing said the Chinese military will maintain diplomatic communication with its Indian counterpart to jointly safeguard peace and stability in the border region.

"China hopes the Indian side can cherish the positive trend of de-escalation in the region and uphold the consensus reached by previous meetings, and work together with China to safeguard peace and tranquillity in the area," senior colonel Long Shaohua, PLA's WTC was quoted as saying in the Chinese readout.

https://www.hindustantimes.com/india-news/pla-sets-up-joint-defence-units-near-indian-border-101619551258791.html

PHYS.ORG

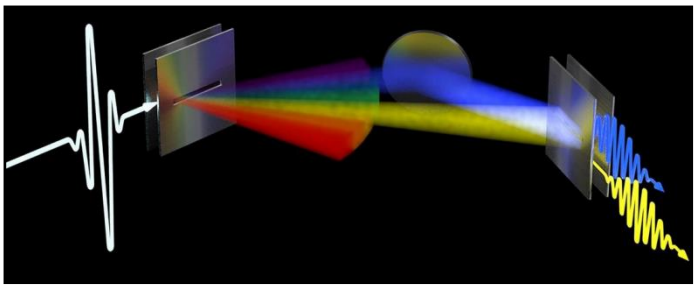
Wed, 28 April 2021

Exploiting non-line-of-sight paths for terahertz signals in wireless communications

If a base station in a local area network tries to use a directional beam to transmit a signal to a user trying to connect to the network—instead of using a wide area network broadcast, as base stations commonly do—how does it know which direction to send the beam?

Researchers from Rice University and Brown University developed a link discovery method in 2020 using terahertz radiation, with high-frequency waves above 100 gigahertz. For this work, they deferred the question of what would happen if a wall or other reflector nearby creates a non-line-of-sight (NLOS) path from the base station to the receiver and focused on the simpler situation where the only existing path was along the line-of-sight (LOS).

In *APL Photonics*, those same researchers address this question by considering two different generic types of transmitters and exploring how their characteristics can be used to determine whether an NLOS path contributes to the signal received by the receiver.



Representation of a transmitter (left) broadcasting a signal with strong angular dispersion. Each frequency is represented by a different color and comes out in a different direction, which produces a rainbowlike structure. Two of the frequencies make it to the receiver (right), one represented by yellow (LOS path) and another by blue (NLOS path incorporating a reflection off a surface). Credit: Mittleman Lab, Brown University

"One type of transmitter sends all frequencies more or less in the same direction," said Daniel Mittleman, co-author and an engineering professor at Brown, "while the other type sends different frequencies in different directions, exhibiting strong angular dispersion. The situation is quite different in these two different cases."

The researchers' work shows that the transmitter sending different frequencies in different directions has distinct advantages in its ability to detect the NLOS path and distinguish them from the LOS path.

"A well-designed receiver would be able to detect both frequencies and use their properties to recognize the two paths and tell them apart," Mittleman said.

Many recent reports within academic literature have focused on various challenges involved in using terahertz signals for wireless communications. Indeed, the term 6G has become a buzzword to encompass future generations of wireless systems that use these ultrahigh-frequency signals.

"For terahertz signals to be used for wireless communications, many challenges must be overcome, and one of the biggest is how to detect and exploit NLOS paths," said Mittleman.

This work is among the first to provide a quantitative consideration of how to detect and exploit NLOS paths, as well as a comparison of the behavior of different transmitters within this context.

"For most realistic indoor scenarios we can envision for an above-100 gigahertz wireless network, the issue of NLOS path is definitely going to require careful consideration," said Mittleman. "We need to know how to exploit these link opportunities to maintain connectivity."

If, for example, the LOS path is blocked by something, an NLOS path can be used to maintain the link between the base station and receiver.

"Interestingly, with a transmitter creating strong angular dispersion, sometimes an NLOS link can provide even faster connectivity than the LOS link," said Yasaman Ghasempour, co-author and assistant professor at Rice University. "But you can't take advantage of such opportunities if you don't know the NLOS path exists or how to find it."

More information: Yasaman Ghasempour et al, Line-of-sight and non-line-of-sight links for dispersive terahertz wireless networks, *APL Photonics* (2021). DOI: 10.1063/5.0039262

https://phys.org/news/2021-04-exploiting-non-line-of-sight-paths-terahertz-wireless.html

PHYS.ORG

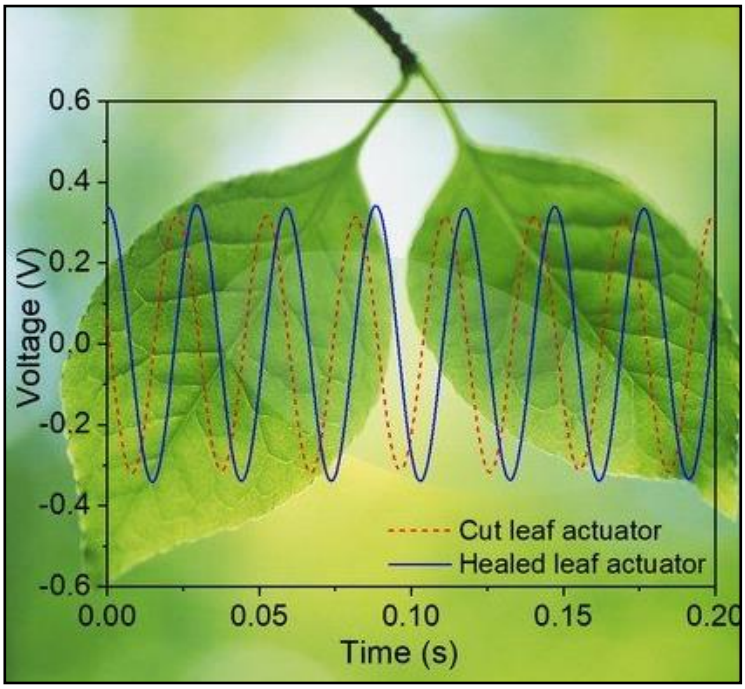
Wed, 28 April 2021

Smart dielectric elastomers for self-healing soft robots

By Alice Scott

Robots that resemble organs are known as soft robots, and in order for them to function they must be made of a flexible material, however a material that can also heal itself would be a bonus if wear and tear was to occur. Researchers from WMG, University of Warwick have designed a self-healing polymers for such devices.

Soft robots, that resemble organs for example, need to be made with highly deformable materials that are capable of changes in shape to allow conformable physical contact for controlled manipulation on order to decrease the chances of mechanical damage—such as tears and punctures.



Time and Voltage of a cut-leaf actuator and healed leaf actuator Credit: WMG, University of Warwick

This had led to a wide interest into the development of self-healing materials and actuators, in particular, the integration of self-healing polymers for bioinspired soft self-healing devices, which are lightweight, low cost and easily processed.

As an invited Communication by the journal Advanced Intelligent Systems, the work on "Piezoelectric-driven self-sensing leaf-mimic actuator enabled by integration of a self-healing dielectric elastomer and a piezoelectric composite," was published on 22 March, 2021, led by the researchers from WMG, University of Warwick have designed a novel self-healing leaf-motion mimic material.

The material is made of an integrated thermoplastic methyl thioglycolate–modified styrene–butadiene–styrene elastomer (MGSBS) and piezoelectric macro fiber composite (MFC) for self-sensing applications.

The leaf-motion mimic actuator provides built-in dynamic sensing and self-healing capabilities to heal macroscale cutting damages with a room-temperature healing capacity and an intrinsic high bandwidth up to 10 kHz.

A prototype of the piezoelectric driven self-healing leaf was cut, and left for 24 hours at room temperature, in that time it had healed itself, after 48 hours it was almost untraceable where the cut had been made.

Dr. Chaoying Wan, from WMG, University of Warwick says, "We have demonstrated the feasibility and potential of the new actuator applied to complex soft autonomous systems. This new material could fill a gap in the robotics-market, as the self-healing soft actuators can sense and repair themselves, creating new damage resistance in soft robotics.

"An example of where they could be used could be in a factory or hospital, they may get damaged from general wear and tear but can heal themselves and therefore do not need to come off duty to be fixed, therefore saving time and resources."

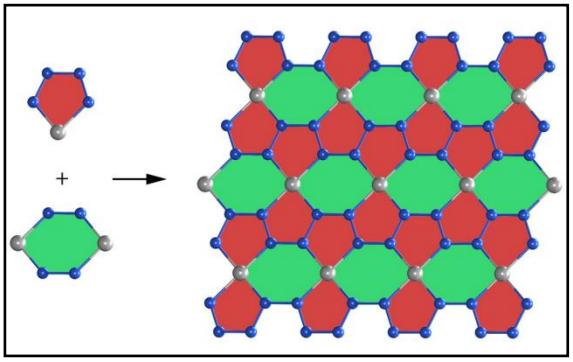
More information: Min Pan et al. Piezoelectric-Driven Self-Sensing Leaf-Mimic Actuator Enabled by Integration of a Self-Healing Dielectric Elastomer and a Piezoelectric Composite, *Advanced Intelligent Systems* (2021). DOI: 10.1002/aisy.202000248

https://phys.org/news/2021-04-smart-dielectric-elastomers-self-healing-soft.html

Wed, 28 April 2021

Researchers discover two-dimensional material using high-pressure technology

An international team with researchers from the University of Bayreuth has succeeded for the first time in discovering a previously unknown two-dimensional material by using modern high-pressure technology. The new material, beryllonitrene, consists of regularly arranged nitrogen and beryllium atoms. It has an unusual electronic lattice structure that shows great potential for applications in quantum technology. Its synthesis required a compression pressure that is about one million times higher than the pressure of the Earth's atmosphere. The scientists have presented their discovery in the journal *Physical Review Letters*.



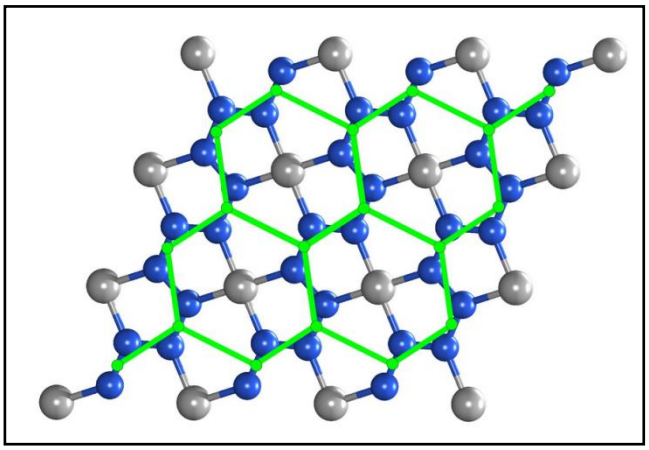
A single beryllonitrene layer consists of BeN_4 pentagons and Be_2N_4 hexagons. The beryllium atoms are shown as grey balls, nitrogen atoms as blue balls. Credit: M. Bykov

Since the discovery of graphene, which is made of carbon atoms, interest in two-dimensional materials has grown steadily in research and industry. Under extremely high pressures of up to 100 gigapascals, researchers from the University of Bayreuth, together with international partners, have now produced novel compounds composed of nitrogen and beryllium atoms. These are beryllium polynitrides, some of which conform to the monoclinic, others to the triclinic crystal system. The triclinic beryllium polynitrides exhibit one unusual characteristic when the pressure drops. They take on a crystal structure made up of layers. Each layer contains zigzag nitrogen chains connected by beryllium atoms. It can therefore be described as a planar structure consisting of BeN_4 pentagons and Be_2N_4 hexagons. Thus, each layer represents a two-dimensional material, beryllonitrene.

Qualitatively, beryllonitrene is a new 2D material. Unlike graphene, the two-dimensional crystal structure of beryllonitrene results in a slightly distorted electronic lattice. Because of its resulting

electronic properties, beryllonitrene would be excellently suited for applications in quantum technology if it could one day be produced on an industrial scale. In this still young field of research and development, the aim is to use the quantum mechanical properties and structures of matter for technical innovations—for example, for the construction of high-performance computers or for novel encryption techniques with the goal of secure communication.

"For the first time, close international cooperation in high-pressure research has now succeeded in producing a chemical compound in that was previously completely unknown. This compound could serve as a precursor for a 2D material with unique electronic properties. The fascinating achievement was only possible with the help of a laboratory-generated compression pressure almost a million times greater than the pressure of the Earth's atmosphere. Our study thus once again proves the extraordinary potential of high-pressure research in materials science," says co-author Prof. Dr. Natalia Dubrovinskaia from the Laboratory for Crystallography at the University of Bayreuth.



The hexagonal electronic lattice (green) of beryllonitride conforms to its crystal structure, and looks like a slightly distorted honeycomb. This results in electronic properties that could be used for quantum technology applications. Credit: M. Bykov

"However, there is no possibility of devising a process for the production of beryllonitrene on an industrial scale as long as extremely high pressures, such as can only be generated in the research laboratory, are required for this. Nevertheless, it is highly significant that the new compound was created during decompression and that it can exist under ambient conditions. In principle, we cannot rule out that one day it will be possible to reproduce beryllonitrene or a similar 2D material with technically less complex processes and use it industrially. With our study, we have opened up new prospects for high-pressure research in the development of technologically promising 2D materials that may surpass graphene," says corresponding author Prof. Dr. Leonid Dubrovinsky from the Bavarian Research Institute of Experimental Geochemistry & Geophysics at the University of Bayreuth.

More information: Maxim Bykov et al. High-Pressure Synthesis of Dirac Materials: Layered van der Waals Bonded BeN4 Polymorph, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.175501

Journal information: *Physical Review Letters*

https://phys.org/news/2021-04-two-dimensional-material-high-pressure-technology.html

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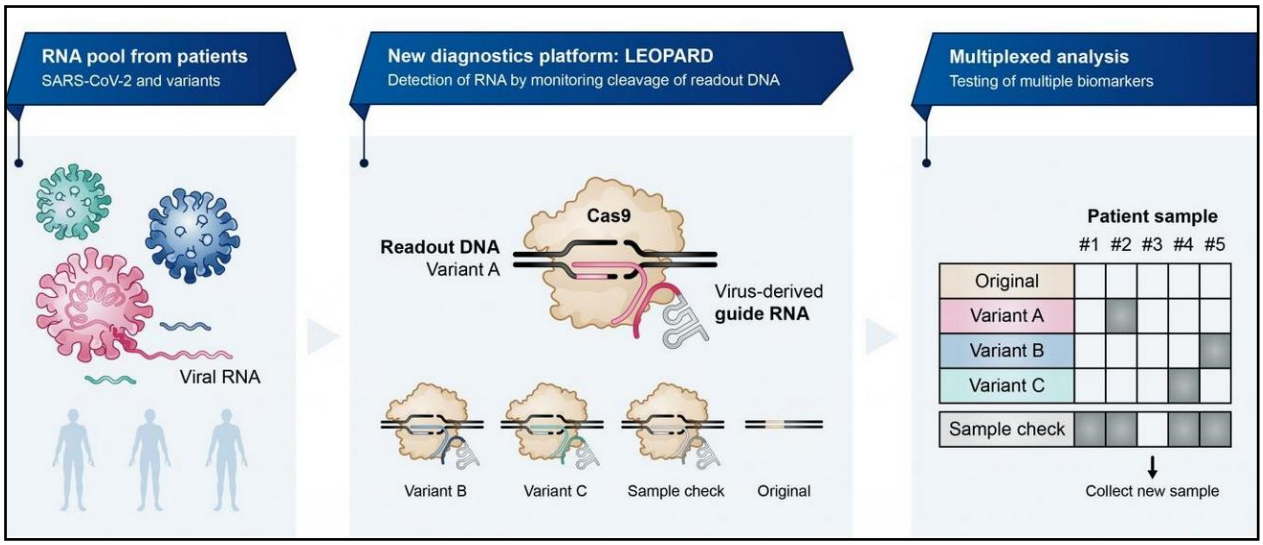
CRISPR discovery paves the way for novel COVID-19 testing method

Most conventional molecular diagnostics usually detect only a single disease-related biomarker. Great examples are the PCR tests currently used to diagnose COVID-19 by detecting a specific sequence from SARS-CoV-2. Such so-called singleplex methods provide reliable results because they are calibrated to a single biomarker. However, determining whether a patient is infected with a new SARS-CoV-2 variant or a completely different pathogen requires probing for many different biomarkers at one time.



The novel platform LEOPARD has the potential to detect a variety of disease-related biomarkers in just one test. Credit: Sandy Westermann / HIRI

Scientists from the Helmholtz Institute for RNA-based Infection Research (HIRI) and the Julius Maximilians University (JMU) in Würzburg have now paved the way for a completely new diagnostic platform with LEOPARD. It is a CRISPR-based method that is highly multiplexable, with the potential to detect a variety of disease-related biomarkers in just one test.

How LEOPARD works

LEOPARD, which stands for "Leveraging Engineered tracrRNAs and On-target DNAs for PArallel RNA Detection," is based on the finding that DNA cutting by Cas9 could be linked to the presence of a specific ribonucleic acid (RNA). This link allows LEOPARD to detect many RNAs at once, opening opportunities for the simultaneous detection of RNAs from viruses and other pathogens in a patient sample.

The study published today in *Science* was initiated by Chase Beisel, professor at JMU and research group leader at HIRI, and Professor Cynthia Sharma from JMU's Institute of Molecular Infection Biology (IMIB). "With LEOPARD, we succeeded in detecting RNA fragments from nine different viruses,' says Beisel. "We were also able to differentiate SARS-CoV-2 and one of its variants in a patient sample while confirming that each sample was correctly collected from the patient."

Background

CRISPR-Cas9 is principally known as a biomolecular tool for genome editing. Here, CRISPR-Cas9 function as molecular scissors that cut specific DNA sequences. These same scissors are naturally used by bacteria to cut DNA associated with invading viruses. Whether editing genomes or eliminating viruses, Cas9 cutting is directed by guide RNAs. The guide RNAs found in bacteria must pair with a separate RNA called the tracrRNA. The RNA couple then can work with Cas9 to direct DNA cutting.

An unexpected discovery

The tracrRNA was thought to only pair with guide RNAs coming from the antiviral system. However, the Würzburg scientists discovered that the tracrRNA was pairing with other RNAs, turning them into guide RNAs. Cynthia Sharma, Chair of Molecular Infection Biology II at the IMIB and spokesperson of the Research Center for Infection Diseases (ZINF) at JMU was astounded by this discovery: "When we searched for RNAs binding to Cas9 in our model organism Campylobacter, we surprisingly found that we detected not only guide RNAs, but also other RNA fragments in the cell that looked like guide RNAs. The tracrRNA was pairing with these RNAs, resulting in "non-canonical" guide RNAs that could direct DNA cutting by Cas9."

The LEOPARD diagnostic platform builds on this discovery. "We figured out how to reprogram the tracrRNAs to decide which RNAs become guide RNAs," says Beisel. "By monitoring a set of matching DNAs, we can determine which RNAs were present in a sample based on which DNAs get cut. As part of the ongoing pandemic, LEOPARD could allow a doctor to figure out whether the patient is infected with SARS-CoV-2, if it's a unique variant, and whether the sample was correctly taken or needs to be repeated—all in one test."

In the future, LEOPARD's performance could dwarf even multiplexed PCR tests and other methods. "The technology has the potential to revolutionize medical diagnostics not only for infectious diseases and antibiotic resistances, but also for cancer and rare genetic diseases," says Oliver Kurzai, director of JMU's Institute of Hygiene and Microbiology, which provided patient samples for the study.

"The work highlights the excellent collaborative and interdisciplinary research taking place here in Würzburg," says Jörg Vogel, director of IMIB and HIRI, a joint facility of JMU with the Helmholtz Center for Infection Research in Braunschweig. "LEOPARD impressively demonstrates that we can cover the full spectrum of complementary cutting-edge research in Würzburg, from the fundamentals of RNA research to clinical applications."

More information: Chunlei Jiao et al. Non-canonical crRNAs derived from host transcripts enable multiplexable RNA detection by Cas9. *Science*. science.sciencemag.org/lookup/ … 1126/science.abe7106

Journal information: *Science*

https://phys.org/news/2021-04-crispr-discovery-paves-covid-method.html